CLAIMS

What is claimed is.

1. A process comprising:

forming a stiffener upon a first substrate, wherein the first substrate includes a top section and a bottom section, wherein the stiffener is disposed against the top section;

contacting the stiffener with a polymer film that is disposed upon a second substrate; and

delaminating the bottom section.

2. The process according to claim 1, wherein contacting the stiffener with a polymer film includes:

forming the polymer film on the second substrate; and

contacting the polymer film against the stiffener under conditions to cause a greater adhesion force between the polymer film and the stiffener than between the top section and the bottom section.

3. The process according to claim 1, wherein forming a stiffener includes:

depositing an oxide on the top section of the first substrate, wherein the stiffener has a roughness that greater than or equal to prime grade polish.

4. The process according to claim 1, wherein delaminating the bottom section includes:

forming an embrittlement zone in the substrate to form the top section and the bottom section; and

heating under conditions to separate the bottom section from the top section.

5. The process according to claim 1, wherein delaminating the bottom section includes: forming an embrittlement zone in the substrate to form the top section and the bottom section; and

heating under conditions to separate the bottom section from the top section.

6. The process according to claim 1, further including:

contacting the top section with a third substrate; and

delaminating the second substrate.

7. The process according to claim 1, further including:

contacting the top section with a third substrate; and

delaminating the second substrate, wherein delaminating the second substrate includes attenuating the polymer film, selected from back-side access through the second substrate and lateral access between the second substrate and the third substrate, and the combination thereof.

8. The process according to claim 1, wherein delaminating the bottom section exposes a fracture surface, further including:

forming a first dielectric layer upon the fracture surface;

contacting the fracture surface with a dielectric layer on a third substrate; and

delaminating the second substrate.

9. The process according to claim 1, wherein delaminating the bottom section exposes a fracture surface, further including:

forming a first dielectric layer upon the fracture surface;

contacting the top section underside with a dielectric layer on a third substrate; and

delaminating the second substrate, wherein delaminating the second substrate includes attenuating the polymer film, selected from back-side access through the second substrate and lateral access between the second substrate and the third substrate, and the combination thereof.

10. A process of forming a bonded epitaxial film device comprising:

forming an active device upon a top section of a first substrate;

forming a stiffener upon the top section of the first substrate, wherein the first substrate includes a bottom section;

contacting the stiffener with a polymer film that is disposed upon a second substrate;

delaminating the bottom section from the top section along a fracture surface;

forming a first dielectric layer upon the fracture surface;

contacting the first dielectric layer with a dielectric layer on a third substrate; and

delaminating the second substrate.

11. The process according to claim 10, after forming an active device and before forming a stiffener , further including:

defining the top section from the bottom section by forming an embrittlement zone therebetween.

12. The process according to claim 10, after forming an active device and before forming a stiffener , further including:

implanting ions into the substrate to form an embrittlement zone and thereby defining the top section from the bottom section.

13. The process according to claim 10, before contacting the stiffener with a polymer film, further including:

forming a polymer film on the second substrate, wherein the polymer film is selected from poly(arylene ether) (PAE), poly(arylene ether ether ketone) (PAEEK), poly(arylene ether ether acetylene) (PAEEA), poly(arylene ether ether acetylene ether ether ketone) (PAEEAEEK), poly(arylene ether ether acetylene ketone) (PAEEAK), poly(naphthylene ether) (PNE), and combinations thereof.

14. The process according to claim 10, before contacting the stiffener with a polymer film, further including:

forming a polymer film on the second substrate, wherein the polymer film is selected from homopolymers, block copolymers, graft copolymers, polymer blends, interpenetrating polymer networks (IPNs), and semi-interpenetrating polymer networks

(SIPNs), wherein forming a polymer film includes dissolving the polymer in a solvent selected from alcohols, ketones, ethers, and combinations thereof.

15. The process according to claim 10, wherein forming a stiffener includes:

depositing an oxide on the top section of the first substrate, wherein the stiffener has a roughness that greater than or equal to prime grade polish.

16. The process according to claim 10, wherein delaminating the bottom section from the top section includes:

heating under conditions to cause a first delamination stress in the embrittlement zone, wherein the first delamination stress is greater than a second delamination stress that exists between the polymer film and the stiffener.

17. The process according to claim 10, wherein forming a first oxide layer upon the fracture surface includes:

forming a first dielectric layer on the fracture surface by a process selected from thermal oxide growth, thermal nitride growth, thermal carbide growth, thermal oxide growth followed by carbon doping, oxide chemical vapor deposition, nitride chemical vapor deposition, carbide chemical vapor deposition, carbon-doped oxide chemical vapor deposition, and combinations thereof.

18. The process according to claim 10, before contacting the fracture surface with a dielectric layer on a third substrate further including:

forming the dielectric layer on the third substrate, by a process selected from thermal oxide growth, thermal nitride growth, thermal carbide growth, thermal oxide growth followed by carbon doping, oxide chemical vapor deposition, nitride chemical vapor deposition, carbide chemical vapor deposition, carbon-doped oxide chemical vapor deposition, and combinations thereof.

19. The process according to claim 10, before contacting the fracture surface with a dielectric layer on a third substrate further including:

forming the oxide layer on the third substrate, wherein the dielectric layer on the third substrate and the first dielectric layer are substantially identical oxides selected from silica, alumina, ceria, thoria, zirconia, hafnia, titania, and combinations thereof.

20. A process comprising:

providing a first wafer including a top section and a bottom section and a stiffener disposed against the top section;

providing an intermediate substrate including a first side and a second side and a polymer film disposed on the first side;

applying the polymer film to the stiffener;

treating the polymer film under conditions that cause the polymer to reflow against the stiffener and to outgas; and

delaminating the bottom section.

21. The process according to claim 20, further including:

debonding the polymer from the stiffener by a process selected from lateral isotropic etching and wet isotropic etching through back-side access through the intermediate substrate.

22. The process according to claim 20, further including:

debonding the polymer from the stiffener by a process selected from lateral isotropic etching and isotropic etching through back-side access through the intermediate substrate, wherein the etching is selected from a wet etch and a dry etch, and wherein the etch chemistry is selected from a wet etch and an oxygen plasma etch.

23. The process according to claim 20 following delaminating the bottom section, further including:

forming a second top section and a second bottom section in the bottom section;

applying a second stiffener to the second top section;

providing an intermediate substrate including a first side and a second side and a polymer film disposed on the first side;

applying the polymer film to the second stiffener; and

delaminating the second bottom section.

24. An article of manufacture comprising:

a first substrate active layer, wherein the first substrate active layer includes an upper surface and a fracture surface that is disposed opposite the upper surface;

a first dielectric layer disposed on the fracture surface;

a stiffener disposed on the upper surface;

a transfer substrate disposed against the first dielectric layer, wherein the transfer substrate includes a transfer substrate dielectric layer.

25. The article according to claim 24, wherein the stiffener has a microsurface roughness that is greater than or equal to about 10 nm.

26. The article according to claim 24, wherein the first active substrate includes a gate stack that extends into the stiffener.

27. The article according to claim 24, further including:

a polymer film disposed against the stiffener, wherein the polymer film has a glass transition temperature above about 200° C.

28. The article according to claim 24, further including:

a polymer film disposed against the stiffener, wherein the polymer film is selected from poly(arylene ether) (PAE), poly(arylene ether ether ketone) (PAEEK), poly(arylene ether ether acetylene) (PAEEA), poly(arylene ether ether acetylene ether ether ketone) (PAEEAEEK), poly(arylene ether ether acetylene ketone) (PAEEAK), poly(naphthylene ether) (PNE), and combinations thereof.

29. The article according to claim 24, wherein the first substrate active layer, the first dielectric layer, the stiffener, and the transfer substrate comprise a bonded, bottom silicon-film device and further including:

a bonded, upper silicon-film device disposed above the bonded, bottom silicon-film device.

30. The article according to claim 29, further including:

at least one bonded silicon-film device disposed above the bonded, bottom silicon-film device, and wherein the upper silicon-film device is disposed above the at least one bonded silicon-film device.